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SERVICE

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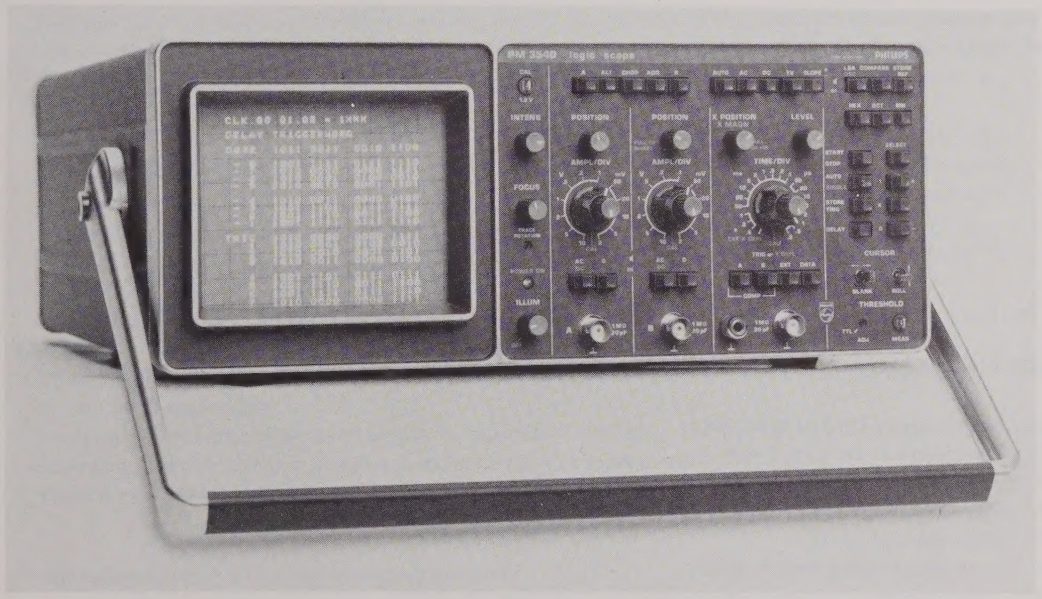

16 Channel logic scope
16 Kanal logik-Oszilloskop
Oscilloscope logique 16 voies
PM3540

Subject: Software alteration in versions/03 and onwards.
Already published: none.

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1. GENERAL INFORMATION

1.1. INTRODUCTION

From version /03 the logic scope PM 3540 is provided with the facility of measuring negative logic signals, to this end the soft-ware has to be altered. Furthermore the service selftest is modified to enable signature analysis measurement.

At the same time the band-width of the oscilloscope part of the PM 3540 is increased from 25 MHz to 35 MHz. The consequenses of these alterations in the manual are dealt with in section 5 of this supplement.

1.2. NEGATIVE LOGIC

The negative logic mode is selected by pressing the 0/— pushbutton and is indicated by the message INV, given in the heading of the display. In this mode, the contents of the data input memory is complemented (see also flow chart fig. 3.9. in the manual).
For returning to the "normal" mode, the 1/+ pushbutton has to be pressed.

1.3. SERVICE SELFTEST ROUTINE

The service selftest routine consists of 7 test modules (test 2 ... test 8) to facilitate isolating functional faults in various parts of the analyzer circuitry. The service selftest can be used in two different modes:

1.3.1. **Functional test mode** by which each selected test module tests the functions of a marked out circuit section.

1.3.2. **Signature analysis mode** to facilitate tracing faults on component level by analyzing signatures generated by the selftest routine itself.
To do this a Signature Analyzer has to be connected to the faulty circuit to compare signatures taken with the Signature Analyzer to those signatures contained in this supplement.
There is one repeatable signature per node.

The recommended procedure of tracing faults is:
- locate the circuitry section where the fault occurs by observing the messages in the display when a test module is called.
  To optimize your diagnosis,it is recommended that the seven tests are completed.
- trace the failure in the located circuitry section by means of signature analysis in the procedure as described before.

1.4. SUMMARY OF TESTS (OR MODULES)

Test 1: Power-up test (not visible, not manipulateable)
Test 2: Delay counter
Test 3: Delay counter, loaded with inverted values as test 2.
Test 4: Address-counter of data input RAM's
Test 5: Data input RAM's
Test 6: Data input circuitry
Test 7: Trigger RAM's
Test 8: Trigger RAM's, loaded with inverted values as test 7.

2. DESCRIPTION OF THE SERVICE TESTS

2.1. POWER-UP TEST (Test 1)

Every time the instrument is switched-on, the micro-processor executes the power-up test, which consists of:
- PROM test (i.e. a check-sum test)
- Scratch-pad RAM test (i.e. a write-read test).

Normally the display on the c.r.t. appears approximately 10 s after switching-on.
If no display, or only one dot appears, one of the possibilities is that the micro-processor remains in the PROM test. The micro-processor is then continuously checking the sum of stored information in the EPROM's. If the display shows an address, the instrument is looping in the RAM test. The micro-processor is continuously checking the address which delivers the faulty data (see Fig. 1).

2.2. FUNCTIONAL TEST MODE (Test 2 ... Test 8)

The selftest routine is selected by pressing STORE TRIG and STORE REF pushbuttons simultaneously, the logic scope enters the selftest program at test 2 (i.e. the first test module).
By pressing the START pushbutton the logic scope enters test 3 and so on until test 8. When START is pressed during test 8 the logic scope jumps to test 2 again (see Fig. 1).

Settings

- No external clock
- No input POD's connected
- No external trigger qualifier

Leaving the service routine is achieved by pressing the X pushbutton.

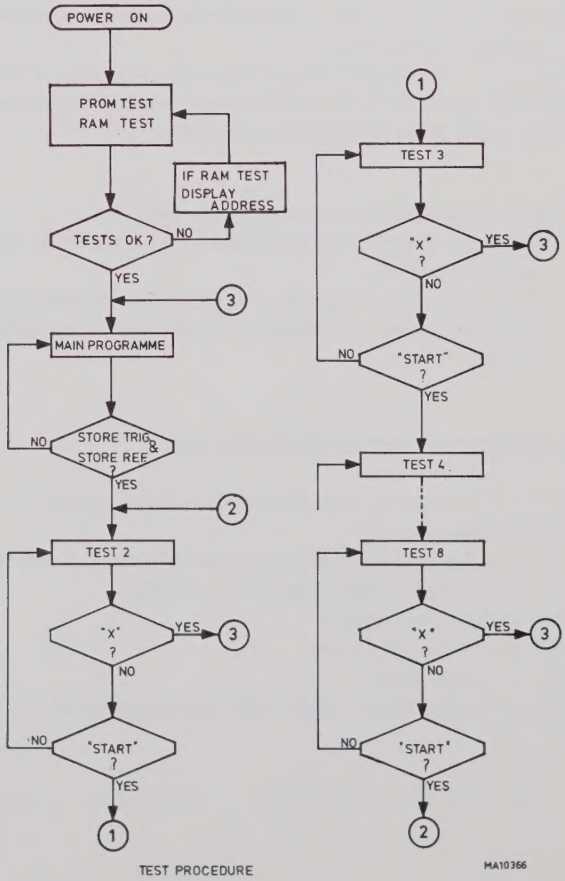


Fig. 1. Flow chart of the test procedure

2.2.1. Test 2 and 3. The delay counter D2024, D2026, D2027, D2028. See fig. 2.

The testmodule 2 enables a testing of the delay counter and the well functioning of the clockpulse generating hardware.
Test 2 has a counter preset of 6969.
Clockpulses are generated by the testmodule to count down the content of the delay counter. When the counter content becomes zero the "WRAM" signal will be reset resulting in a disabling of the clockpulses.
On the display will be shown the text: "TEST 2 IS OK, CNT = ...".
The count is displayed in decimal digits and must be equal to the number given above for the preset.
If the "WRAM" fails to be reset then the counter will overflow. This is mentioned by the text: "TEST 2 FAILS" on the display.
If "SELECT" is depressed the module will be continuously repeated. Whether faulty or not. Eventually the overflow value 9984 will then be displayed.
In case the displayed count is not equal to the preset number, the counted result may be checked on the hardware by means of a logic scope.
If the count appears to be higher than the measured one, either the clockpulse circuit failed or the counter did not accept all clockpulses. If it is lower, than a decade may produce false carries.
The clockpulse can be shown on an oscilloscope while "SELECT" is pressed. Probe at D2036, pin 5, for triggering the scope, probe at D2023, pin 5 (neg.) or pin 6 (pos.).
If no "SYSCL" pulses are present, check wether D2036, pin 12 is high. If not so, test the triggerword rams.
Be sure that the "WRAM" control circuit operates correctly in case of overflow (test 6).

Note: The clock and qualifiers inputs must remain unconnected.

Test 3 is equivalent to test 2, but the counter preset is 9696.

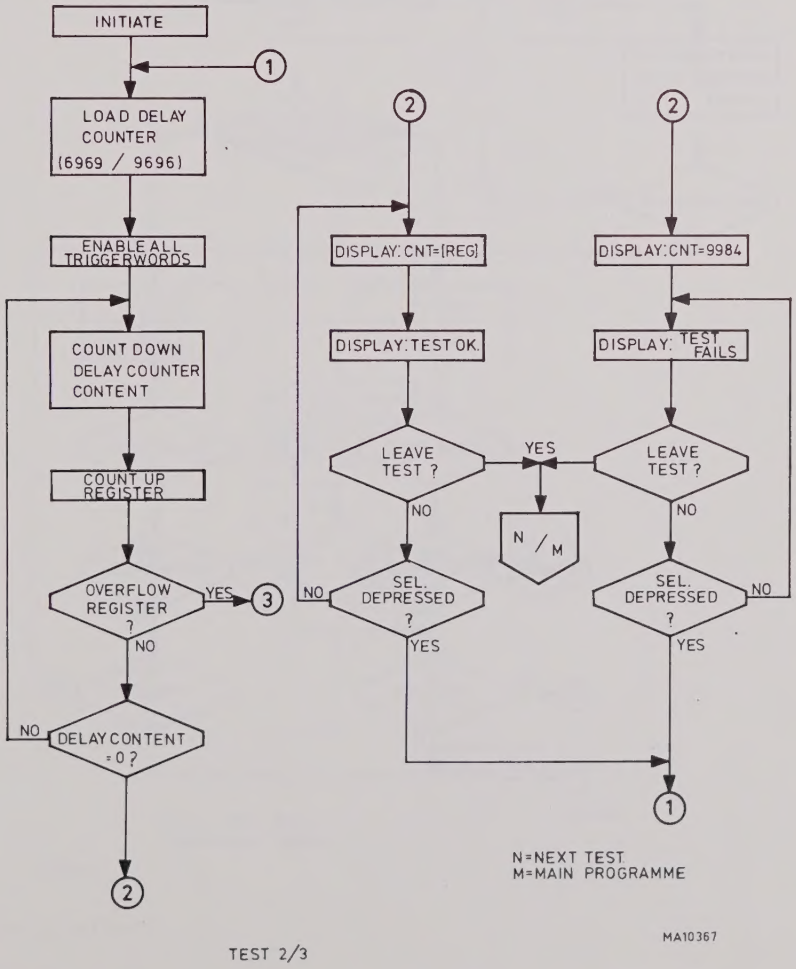


Fig. 2. Flow chart of the tests 2 and 3

2.2.2. Test 4. The dataram addresscounter. See fig. 3.

The addresscounter D2014 and D2017 can be tested by testmodule 4. The counter is loaded with a given value and the output address is compared with the input value.
The input value is incremented each time the loop is repeated.
In order to pass through all possible input values when there is a discrepancy between input and output, a "TEST 4 FAILS" message will be displayed. The program stops at the last value being displayed in two hexadecimal digits.
As long as there is no failure observed, a "TEST 4 IS OK" message is displayed with unstable digits.
During the same run the counter is tested for clockpulse input. Two output values from before and after a clock-pulse are compared.
In case "SELECT" is depressed, the loop is always repeated with the last value unchanging. Pressing "0" makes the value move on by one step.
If failures occur, check first the clockpulse "SYSCL" to be caused by "CLDIM".

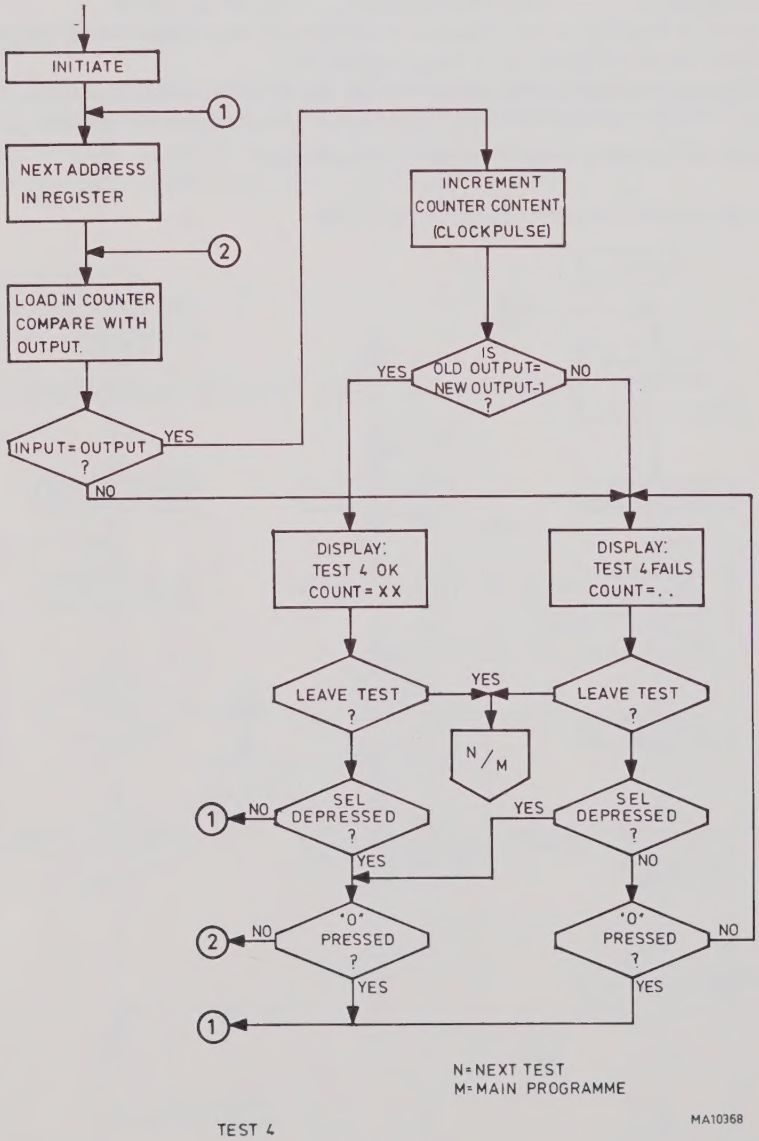


Fig. 3. Flow chart of test 4

2.2.3. Test 5. Datarams. See fig. 4.

The datarams D2018 and D2019 are tested by means of testmodule 5. To this end the input terminals may be connected to any configuration of low and high levels, providing a wellknown and modifiable 16 bit data input signal. This input signal is then constantly loaded on all 64 addresses of the dataram.
The output of the dataram is read and displayed in four columns of 16 lines after the test "TEST 5" at the first line.
Each column contains 4 hex. digits of the 16 bit data word, the first column of the addresses 0-15. The second column of the addresses 16-31, etc.
Apart from "START/STOP" no switches are used in this module.
The test can only be implemented if the "WRAM" and the "SYSCL" signals are well functioning. The same holds for the address counter.
In case of failures, the output signals of the gates D2006, D2007 and of the latches D2012, D2013 and of the datarams D2018, D2019 may be compared by means of a logic scope, to locate the defective circuit element.
Check whether D2006/7, pins 1-19 are at zero level during the test. If not, use test module 6 to verify.

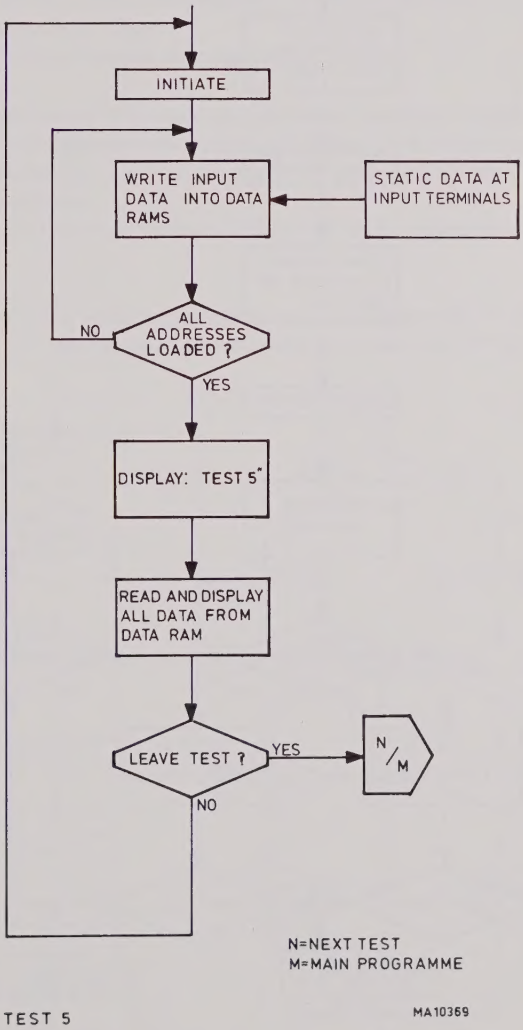


Fig. 4. Flow chart of test 5

2.2.4. Test 6. Signals for data input control. See fig. 5.

With the testmodule 6 a check can be performed on the effect of the commands "HLTDI" and "STRDI". This is done by checking the "WRAM" signal by the program.
The "WRAM" signal is tested after the "HLTDI" command and after the command "STRDI".
The entire program loop is repeated until a failure is produced or "START/STOP" is pressed to request for next testmodule.
When a failure is produced the loop is shortcut to the display function, displaying' "TEST 6 FAILS", in order to catch incidentally occuring failures.
Pressing "SELECT" (or "0" for one run) restores the entire loop to enable observing systematic failures by means of suitably probing the hardware circuits around the bistable D2023. (pin 8/13). Or examing the effect of instructions of the module on the circuit by means of a logic scope (see 2.3.3.).

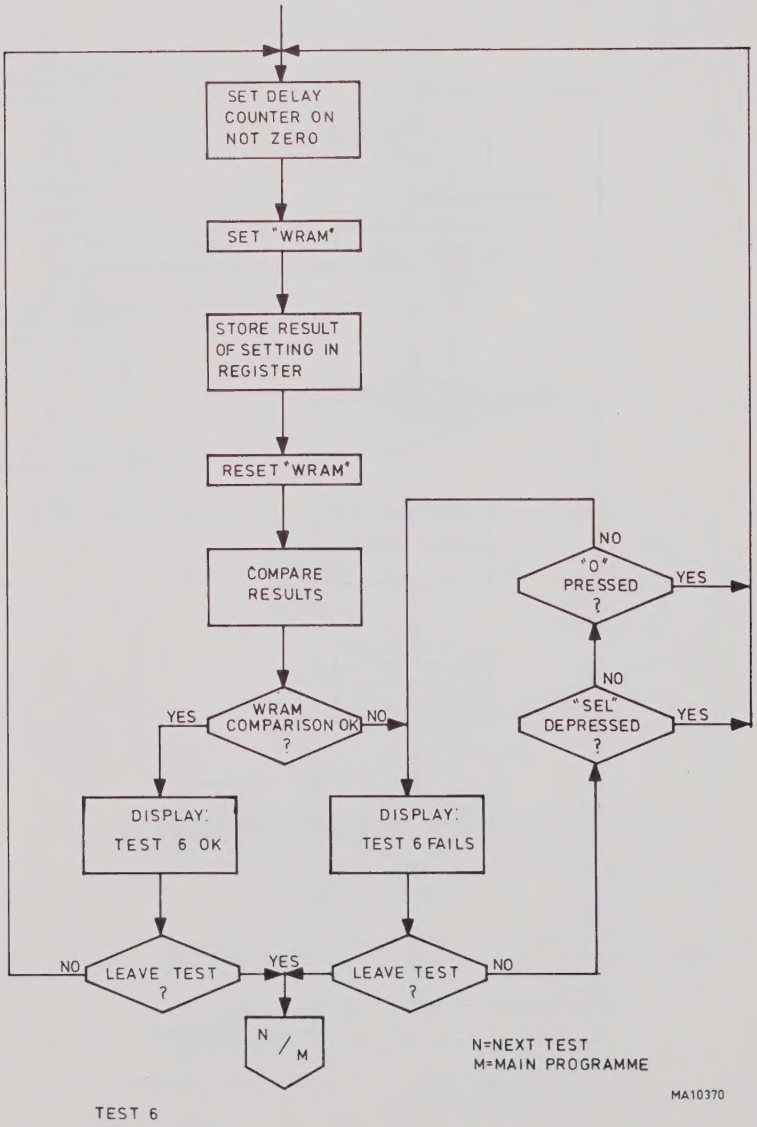


Fig. 5. Flow chart of test 5

2.2.5. Test 7 and 8. Trigger rams. See fig. 6.

The trigger rams D2009 and D2011 are tested in parallel.

Test 7.
By this test the even words (addr.) and the last odd word of the trigger rams are loaded with "1" (= zero output).
And the odd words with "0" (= high level output).
After loading, the rams are read in parallel and each time the output D2009, pin 6, becomes high, the one byte triggerword value is stored in the dataram.

During each read loop the triggerword is compared with the stored value in the dataram. The values are equal when the pin 6 signal became high and unequal when this signal stayed at low level during the reading loop. Additional to the normal text, the triggerword value is displayed in hex. code. This display will only be stable when a failure is produced or "SELECT" has been pressed.
In the testprogram for the PM 3540/03, the presence of high triggerram output is checked via the clockpulse generating circuit and the "WRAM" set/rest.

The switch "SELECT" can be used to let the reading loop run without changing the triggerword.
If a failure is announced by the display, then depress "SELECT", and probe D2009, pin 6, to check on appropriate presence or absence of pulses.
Pressing "0" results then in incrementing the triggerword by one.

Note: The first and last address of the triggerrams are always loaded for zero output at pin 6. In order to feature testing of the triggerram input gates and wiring. If for instance a bit of the triggerram input lines is sticking to zero, test 7 will reveal it and if it sticks to high level, test 8 will reveal it by displaying the failing address.
It means however that the two addresses OO and FF of the triggerrams are not tested.

Test 8.
This test is the same as test 7 but with opposite loading of the triggerrams, by this test the odd addresses of the rams are loaded with "1" (zero output) and the even addresses with "0" (high level output).
See note test 7.

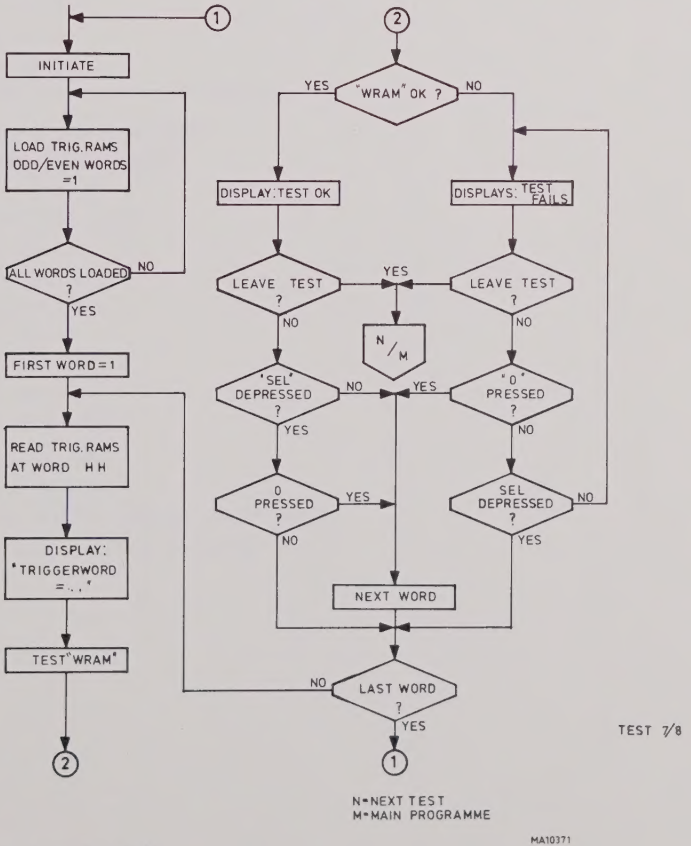


Fig. 6. Flow charts of the tests 7 and 8

2.3. FAILURE TRACING VIA THE SELFTEST

2.3.1. Failing of the display

If the instrument, when switched on, does not show character display in LSA mode, then verify:

- That the cathode-ray tube circuit and the time-base generator are operating correctly.
  To check this switch to OSC.-mode and adjust with potmeters FOCUS, INTENS and POSITION for a well-defined display.
  If no result is obtained then check the oscilloscope tube-biasing and -functioning procedures as has been described for the oscilloscope (for this, see the manual).
- The functioning of the testprogram.
  To check this switch on the testing program by pressing STORE REF and STORE TRIG simultaneously.
  Verify whether pulse activities are present with an oscilloscope or analyzer at:
  D2008, pins 5 and 6.
  D2069, pins 1, 2 and 3.
- The controls signals not to be zero.
  Check $\overline{\text{RDIM}}$ and $\overline{\text{MATRIX}}$ (D2063, pins 14, 11).
  And the READY signal (D2059, pin 35).
- The micro-processor to function correctly.
  This can be tested in free running mode, see chapter 4.

Note: The program may have been interrupted by a trivial interference and hold up in some loop. Therefore try always a second switching on of the instument.

2.3.2. Failing of functional tests

The following procedure is given as an aid to optimize your diagnosis. A combination of failing tests can give a clearer indication of the faulty circuitry. All functional test modules should be checked before any conclusion is drawn.

– Test 2, 3	OK with CNT = 0000
Test 5	Failing at all addr.
Test 6	Failing
Test 7, 8	Failing at odd resp. at even addr. alternatively.
	Check if "WRAM" is drawn to zero.
	D2022, pin 9.
	Check D2023, pins 8, 9, 10, 13 and so on at test 7, 8.
	Check further Test 6 hardware diagram.
– Test 2, 3	Failing with overflow. CNT = 9986
Test 6	Failing
Test 7, 8	Failing at odd/even addr.
	Check if "WRAM" is drawn to high level at test 7, 8:
	D2032, pin 8
	Check further Test 6 hardware diagram.
– Test 2, 3	OK with CNT = 0000
Test 4	Failing at all addr.
Test 5	Failing at all addr.
Test 7, 8	Failing at odd/even addr.
	Check "SYSCL" with an oscilloscope
	D2036, pins 1-6
– Test 2, 3	OK with CNT = 0000
Test 5	Fails at all addr.
Test 7, 8	Failing at odd/even addr.
	Check at test 7/8, D2021, pin 3
	D2022, pin 2
	D2029, pin 3
	D2033, pin 8
	Check "SYSCL" with an oscilloscope
– Test 2, 3	Failing with overflow (9986)
Test 7, 8	Failing at odd/even addr.
	Check at test 7/8
	D2009/D2011, pin 6
	D2008, pin 11
	Check at test 2/3
	D2023 pins 1-6 or
	D2024, pin 12
	D2031, pins 5, 6
	D2032, pins 5, 4
	D2036, pins 8-13.
– Test 4	Failing at all addr.
Test 5	Failing at all addr.
	Check if "$\overline{\text{RDIM}}$" (D2014, pin 11, etc.)
	remains high and is not pulsating.

2.4. HINTS FOR DETECTING FAULTS IN CIRCUITRY NOT COVERED BY THE SELFTEST

2.4.1. Failures in the Display circuitry

For tracing failures in the display circuitry are no tests provided. These failures can be recognized easy during normal operation and traced by means of signature analysis, oscilloscope or analyzer.

- Line and character position, the horizontal and vertical deflection are controlled by DAC-signals. The vertical deflection can be checked with an oscilloscope by probing at points R2106/R2104/R2107 and zero-level. Depending on the contents of the screen a staircase pattern is shown with a maximum of 23 steps.
- The horizontal deflection can be checked with an oscilloscope by probing at points X25-6 and X25-4 or/and at R2157/R2156/R2158 and zero-level. The staircase pattern has now a maximum of 32 steps.
- The latch inputs and outputs of latch D2077 can be checked by an oscilloscope. By means of a logic analyzer the ASCII-codes can be checked.
- Decoder D2077 and character generator D2076 can both be checked by a logic analyzer.
- Z-mod gate D2008. Check by comparing the signals on pin 5 and pin 6 on different signals.
- The parts of the circuitry not described can be checked, during display operation, by an oscilloscope.
- The SID-pin of the μP must have zero-level when the LSA mode is selected.

2.4.2. Clockpulse circuit

"SYSCL" pulses are too short to be discerned by S.A. directly.
The presence of them is however indicated by the status of the bistables and thence by the signatures and the flickering of the probe lamp.
To observe "SYSCL" pulses use an oscilloscope on D2036 pin 5 e.g. triggered by the read/write signal leading edge.
"SYSCL" pulses are generated by a "CLDIM" signal during test 4.
If this is failing then test 4 claims a failing test at all addresses of the dataram addresscounter.
For the PM 3540/03 also tests 7 and 8 will in that case display a failure at alternative addresses.
During test 2 and 3, "SYSCL" is generated by latch pulses.
Overflow and failure is displayed when "SYSCL" pulses are missing.

2.4.3. Testing with the logic scope

If a logic scope is available, connect the input terminals to the data and address lines of the 8085 bus system of the tested instrument. Derive a clock pulse from the read and/or write signal of the microprocessor.
Triggering of the logic scope can be adjusted by selecting an appropriate delaytime after determining the triggerword from the program listing.
Any other external oscilloscope can be used if necessary and triggered by deriving a signal from X-18 of the measuring logic scope. In this way the effect of a particular instruction on the circuit can be examined and the circuit tested.
Circuit outputs can be displayed simultaneously if connected to the logic scope input terminals (use one L.S.B.).

3. SIGNATURE ANALYSIS MODE

3.1. GENERAL INFORMATION

Signature Analysis is used in preference in combination with functional testing.
A functional test may determine the hardware area that contains the defect or defective component.
The number of signatures to be tested can then be reduced considerably.
Finding the source of the faulty signatures will however not always lead straight to the defective component
In case more IC's are connected to one wire (WIRE-AND Mode) and/or if one short circuited in- or output caused the damage of another, it will need some closer testing with additional means, e.g. using a logic pulser and a current tracer and/or a sensitive oscilloscope may reveal the direction of (short-circuit) currents or pulse voltage drops.
The most difficult defects are caused by IC's that are deteriorating and beginning to produce high voltage drops or high leakage currents and too slow rise and fall times.
With the aid of an oscilloscope this type of defects can best be traced.

Other fault finding aids are:

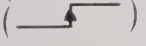
- Logic probe (S.A. probe) : to detect the presence of pulses and logic levels.
- Logic clip : to see the functioning of a particular IC on LED display.
- Logic comparator : to compare any particular IC with an external one getting the same input and power supply.

3.2. SELECTION OF THE S.A. MODE

When all the test modules are observed and conclusions are drawn the failure can be traced by means of signature analysis.
In order to generate stable signatures each test module must be set in a loop.
This is done by selecting the failing test module and depressing the pushbutton AUTO. Then signatures are generated in the section of the circuitry enclosed by the selected test. Be aware that only in that particular section of the circuitry the signatures can be used for comparison. The functional test program can be re-entered by releasing the AUTO push-button.

3.3. CONNECTIONS AND SETTINGS

In order to get the right signatures the connection of the Signature Analyzer to the Logic Scope should always be the same.

Connections	: START	: D2059 - pin 34, I/O signal from microprocessor
	STOP	: D2059 - pin 34, I/O signal from microprocessor
	CLOCK	: D2051 - pin 11, Read/Write signal of microprocessor
Settings	: START	: negative going edge
	STOP	: positive going edge
	CLOCK	: positive going edge 

3.4. FAILURE TRACING WITH S.A.

Select the failing test module and depress the pushbutton AUTO. Then signatures are generated in the circuitry enclosed by this test.

The signatures can be traced by using the following hardware diagrams.
The first column indicates the IC numbers dealing with the main stream of data, the second and third column indicate the IC numbers for substreams of data. The procedure is roughly:
Start checking and comparing signatures at the first column downwards and move horizontally to the second column and downwards when failures are no longer observed in the first, etc. Consult the wiring diagram when aberations in the procedure appear to be necessary.

Note: The display circuitry can be checked with signature analysis in test module 5.
So in that module can not only the signatures of the Data Acquisition Memory, but also the display circuitry be checked.
All pushbuttons must be released except LSA/OSC and AUTO.

D2031, pin 8 drawn to zero or D2033, pin 8 drawn high will not be detected by the functioned tests.
Signatures at these points are changed then.
These errors cause continuous "SYSCL" pulses giving rise to mutilation of data at normal operation.

TEST 2 AND 3

I	II	III
D2023 p8-13		
	D2024	
		D2063 p12, etc.
	D2032 p1,2,3,11,12,13	
		D2039 p1, 2
D2032 p4, 5, 6		
	D2036 p1-5	
D2031 p1-6		
	D2023 p1-6	
D2026 D2027 D2028		
	D2024	
	D2008, p8, 9, 10	D2036, p8-13

List of signatures of this test is given in chapter 3.5.

TEST 4

I	II	III
D2014 D2017		
	D2016 p4, 5, 6 D2036 p1-5 D2063 p1-6, 14	
D2062		
	D2059 μP	

List of signatures of these tests is given in chapter 3.5.

TEST 5

I	II	III
	D2053 D2054 p4, 7, 9, 12 D2056 2, 14, 1, 15 D2057	
		D2051 p4, 5, 6 D2062
D2018 D2019		
	D2016 p1, 2, 3, 11 12, 13 D2014 D2017	
D2012 D2013		
	D2036 p1-5	
D2006 D2007		
	D2023 p8-13	

List of signatures of these tests is given in chapter 3.5.

TEST 6

I	II	III
D2023 p8-13		
	D2024 (see test 2) pin 12	
	D2032 p1, 2, 3	
		D2039 p1,2
		D2032 p11, 12, 13
	D2032 p4, 5, 6	
D2022 p8, 9, 11		
	D2063 p1-6, 15	
		D2062

List of signatures of these tests is given in chapter 3.5.

TEST 7 and 8

I	II	III
	check on "SYSCL"	
	D2036 p1-5	
		D2034 p1, 2, 3, 11 12, 13
D2009		
D2011		
	D2008 p 1, 2, 3, 11 12, 13	
D2003		
D2004		
	D2023 p8-13	

List of signatures of this test is given in chapter 3.5.

3.5. LIST OF SIGNATURES

Signatures test 2 and 3

D2023	1	62A2
	2	0000
	3	0000
	4	0305
	5	4247
	8	U450
	9	96U2
	10	62A2
	11	U709
	12	4723
	13	O223
D2032	4	U709
	5	95AC
	6	0000
D2031	1	CPP6
	2	9P70
	3	
	4	8HHA
	5	20P5
	6	95AC
D2026	1	661A
	2	6HHC
	3	PP1C
	4	0000
	5	62A2
	6	7555
	7	4HFC
	8	0000
	9	9UA4
	10	52CA
	11	0305
	12	9P70

D2026	13	9752
	14	2581
	15	CAP6
	16	62A2
D2027	1	HHC5
	2	48UH
	3	2002
	4	0000
	5	62A2
	6	H14U
	7	C983
	8	0000
	9	42U3
	10	A2AA
	11	0305
	12	CPP6
	13	HU24
	14	9752
	15	5H41
	16	62A2
D2028	1	661A
	2	29P2
	3	0811
	4	0000
	5	62A2
	6	6FP8
	7	2HU8
	8	0000
	9	9UA4
	10	52CA
	11	0305
	12	8HHA

D2028	13	A85U
	14	HU24
	15	CAP6
	16	62A2
D2024	1	HHC5
	2	8HA6
	3	U9C7
	4	4247
	5	62A2
	6	P534
	7	CCIC
	8	0000
	9	42U3
	10	A2AA
	11	O305
	12	4723
	13	2581
	14	0000
	15	5H41
	16	62A2
D2032	1	O223
	2	6081
	3	0000
	11	0000
	12	62A2
	13	0000
D2036	1	62A2
	2	94H1
	3	215F
	4	62A2
	5	0000
	8	62A2

D2036	9	0000
	10	62A2
	11	0000
	12	62A2
	13	62A2
D2008	8	O305
	9	O305
	10	A52A
D2063	12	O305
	13	P777
	14	62A2
	15	A6A0
	16	62A2
D2039	1	0223
	2	6081

Signatures test 4

D2014	1	U7HC
	2	OU7P
	3	3P12
	4	0000
	5	0000
	6	3109
	7	55H8
	8	0000
	9	C7P2
	10	P779
	11	C4U8
	12	7805
	13	9UCC
	14	8026
	15	U27A
	16	P7CP

D2017	1	H1H4
	2	0000
	3	C53H
	4	9UCC
	5	0000
	6	0000
	7	0000
	8	0000
	9	0000
	10	0000
	11	C4U8
	12	0000
	13	P7CP
	14	8026
	15	HA72
	16	P7CP

D2062	1	0000
	2	38PC
	3	32FU
	4	P156
	5	H1H4
	6	C7P2
	7	A9U8
	8	1F65
	9	U7HC
	10	0000
	11	0000
	12	U27A
	13	9985
	14	94AH
	15	P779
	16	HA72
	17	P145
	18	FH8H
	19	H6A9
	20	P7CP

D2016	4	9UCC
	5	7805
	6	7805

D2036	1	6798
	2	0000
	3	6F71
	4	6798
	5	8026

D2063	1	76F1
	2	COOP
	3	9048
	4	0000
	5	0000
	6	779H

D2063	14	C4U8

D2059	1	
	2	
	3	0000
	4	0000
	5	0000
	6	0000
	7	0000
	8	0000
	9	P7CP
	10	0000
	11	P7CP
	12	9985
	13	1F65
	14	94AH
	15	A9U8
	16	P145
	17	P156
	18	FH8H
	19	32FU
	20	0000
	21	U8C8
	22	3A3C
	23	7P99
	24	76F1
	25	COOP
	26	9048
	27	0000
	28	779H
	29	OC13
	30	0000
	31	P7CP
	32	P7CP

D2059	33	F7U4
	34	0000
	35	P7CP
	36	P7CP
	37	P7CP
	38	0000
	39	0000
	40	P7CP

Signatures test 5

D2018		
	1	6F95
	2	227H
	3	H81U
	4	10U9
	5	10U9
	6	10U9
	7	10U9
	8	10U9
	9	10U9
	10	10U9
	11	10U9
	12	10U9
	13	0000
	14	0000
	15	OU7C
	16	0000
	17	0000
	18	0000
	19	0000
	20	0000
	21	0000
	22	0000
	23	0000
	24	0000
	25	6F41
	26	9682
	27	U535
	28	10U9
D2019	1	6F95
	2	227H
	3	H81U
	4	10U9
	5	10U9
	6	10U9
	7	10U9
	8	10U9
	9	10U9
	10	10U9
	11	10U9
	12	10U9
	13	0000
	14	0000
	15	AU63
	16	AU63
	17	0000
	18	0000
	19	0000
	20	0000
	21	0000
	22	0000
	23	0000
	24	0000
	25	6F41
	26	9682
	27	U535
	28	10U9

D2012		
	1	0000
	2	10U9
	3	10U9
	4	10U9
	5	10U9
	6	10U9
	7	10U9
	8	10U9
	9	10U9
	10	0000
	11	0000
	12	10U9
	13	10U9
	14	10U9
	15	10U9
	16	10U9
	17	10U9
	18	10U9
	19	10U9
	20	10U9
D2013	1	0000
	2	10U9
	3	10U9
	4	10U9
	5	10U9
	6	10U9
	7	10U9
	8	10U9
	9	10U9
	10	0000
	11	0000
	12	10U9
	13	10U9
	14	10U9
	15	10U9
	16	10U9
	17	10U9
	18	10U9
	19	10U9
	20	10U9
D2006	1	0000
	2	
	3	10U9
	4	
	5	10U9
	6	
	7	10U9
	8	
	9	10U9
	10	0000
	11	
	12	10U9
	13	
	14	10U9
	15	
	16	10U9

D2006		
	17	
	18	10U9
	19	0000
	20	10U9
D2007	1	0000
	2	
	3	10U9
	4	
	5	10U9
	6	
	7	10U9
	8	
	9	10U9
	10	0000
	11	
	12	10U9
	13	
	14	10U9
	15	
	16	10U9
	17	
	18	10U9
	19	0000
	20	10U9
D2053	1	P354
	2	70HH
	4	0000
	7	553A
	9	60H3
	12	0000
	14	24FA
	15	P354
D2054	1	P354
	2	70HH
	4	0000
	7	PCH8
	9	3APU
	12	0000
	14	24FA
	15	P354
D2056	1	P354
	2	70HH
	4	0000
	7	51FP
	9	C2P8
	12	0000
	14	24FA
	15	P354
D2057	1	P354
	2	70HH
	4	0000
	7	P7F9
	9	2H90
	12	0000
	14	24FA
	15	P354

D2016		
	1	0U7C
	2	1932
	3	COP1
	11	345A
	12	COP1
	13	AU63
D2014	1	99CF
	2	H81U
	3	6F41
	4	0000
	5	0000
	6	9682
	7	227H
	8	0000
	9	6HHH
	10	7124
	11	COP1
	12	UF84
	13	PF7H
	14	0000
	15	345P
	16	10U9
D2017	1	300A
	2	6F95
	3	U535
	4	PF7H
	5	0000
	6	5F5A
	7	0000
	8	0000
	9	0000
	10	0000
	11	COP1
	12	0000
	13	10U9
	14	0000
	15	6966
	16	10U9
D2036	1	10U9
	2	7C5F
	3	9HP6
	4	10U9
	5	0000
D2023	8	10U9
	9	0000
	10	10U9
	11	0000
	13	7C5F
D2051	4	COP1
	5	434F
	6	P354
D2062	1	0000
	2	70HH
	3	2H90
	4	P7F9
	5	300A

Signatures test 5 cont.

D2062	6	6HHH
	7	C2P8
	8	3APU
	9	99CF
	10	0000
	11	0000
	12	345P
	13	60H3
	14	553A
	15	7124
	16	6966
	17	PCH8
	18	51FP
	19	24FA
	20	10U9
D2077	5	60C7
	6	704P
	7	0000
	8	0000
	10	AF7C
	11	71F8
	12	0000
	16	10U9
D2072	1	5850
	2	F3F0
	3	10U9
	4	10U9
	5	0000
	6	71F8
	7	3671
	8	0000
	9	10U9
	10	0000
	11	AF7C
	12	10U9
	13	10U9
	14	4762
	15	C901
	16	10U9
D2073	1	5850
	2	0000
	3	0000
	4	0000
	5	3671
	6	H326
	7	P799
	8	0000
	9	10U9
	10	0000
	11	HHA0
	12	10U9
	13	0000
	14	0000
	15	C901
	16	10U9
D2074	1	10U9
	2	2F5P
	3	P7F9
	4	553A
	5	C9HA
	6	60H3
	7	8742
	8	0000
	9	CF1U
	10	6U5H
	11	3APU
	12	0000
	13	C2P8
	14	PCH8
	15	H4C8
	16	10U9
D2071	1	C92U
	2	10U9
	3	0000
	4	10U9
	5	5850
	6	48A9
	7	0000
	8	A9U8
	9	C901
	10	10U9
	11	10U9
	12	A9U8
	13	10U9
	14	10U9
D2069	1	48A9
	2	CF1U
	3	CF1U
	4	345A
	5	844F
	6	COUH
	7	0000
	8	C92U
	9	1932
	10	844F
	11	10U9
	12	5850
	13	CF1U
	14	10U9
D2008	4	0000
	5	60C7
	6	60C7
D2078	1	10U9
	2	7AF3
	3	PCH8
	4	553A
	5	HP9U
	6	60H3
	7	7CC1
	8	0000
	9	COUH
	10	
	11	
	12	HF0A
	13	3APU
	14	C2P8
	15	431C
	16	10U9
D2079	1	10U9
	2	F58P
	3	PCH8
	4	553A
	5	3P71
	6	60H3
	7	P4H4
	8	0Q00
	9	844F
	10	0000
	11	2H90
	12	UF6H
	13	3APU
	14	C2P8
	14	H730
	16	10U9
D2058	1	10U9
	2	10U9
	3	10U9
	4	10U9
	5	10U9
	6	10U9
	7	0000
	8	10U9
	9	10U9
	10	10U9
	11	10U9
	12	10U9
	13	10U9
	14	10U9

Signatures test 6

D2023	8	805F
	9	P6FP
	10	A9UF
	11	0000
	12	0000
	13	4F05
D2022	8	7AH7
	9	A9U7
	11	3720
D2024	12	0000
D2032	4	0000
	5	6692
	6	FU6P
	11	0000
	12	6692
	13	0000
D2063	1	OC17
	2	9888
	3	3CP8
	4	0000
	5	0000
	6	HU9A
	15	3720
D2039	1	4F05
	2	2A97

D2062	1	0000
	2	939U
	3	F1UU
	4	PF71
	5	29C6
	6	CFP1
	7	APH3
	8	7AH7
	9	6756
	10	0000
	11	0000
	12	U86H
	13	889F
	14	H5A2
	15	6088
	16	U053
	17	706P
	18	9UU8
	19	939U
	20	6692

Signatures test 7, 8

D2009	1	0H29
	2	69CC
	3	0000
	4	0000
	5	0000
	6	40AA/8U83
	7	4F00
	8	0000
	9	P40F
	10	P4HP
	11	C7U4
	12	FH91
	13	6H5C/C895
	14	5P96
	15	1729
	16	0F4U
D2011	1	0H29
	2	69CC
	3	0000
	4	0000
	5	0000
	6	40AA/8U83
	7	4F00
	8	0000
	9	P40F
	10	P4HP
	11	C7U4
	12	FH91
	13	6H5C/C895
	14	5P96
	15	1729
	16	0F4U
D2003	1	0000
D2003	2	1729
	3	0H29
	4	69CC
	5	5P96
	6	P4HP
	7	C7U4
	8	P40F
	9	4F00
	10	0000
	11	4F00
	12	P40F
	13	C7U4
	14	P4HP
	15	5P96
	16	69CC
	17	0H29
	18	1729
	19	0000
	20	0F4U
D2004	1	0000
	2	1729
	3	0H29
	4	69CC
	5	5P96
	6	P4HP
	7	C7U4
	8	P40F
	9	4F00
	10	0000
	11	4F00
	12	P40F
	13	C7U4
	14	P4HP
D2004	15	5P96
	16	69CC
	17	0H29
	18	1729
	19	0000
	20	0F4U
D2036	1	1ACU
	2	0000
	3	0000
	4	1ACU
	5	16U0
D2008	1	AH15
	2	FH91
	3	FH91
	11	FH91
	12	839P
	13	FH91
D2023	8	0000
	9	0F4U
	10	0000
	11	0000
	12	H9HC
	13	0F4U
D2034	1	0F4U
	2	0000
	3	0F4U
	11	1ACU
	12	0F4U
	13	16U0

4. TESTING THE MICROPROSSESOR AND ADDRESS BUS

The selftest programs can only be used if the microprocessor μP, the EPROMS address- and data bus are functioning well.
If there is any doubt the μP can be replaced or tested externally in free-running mode.

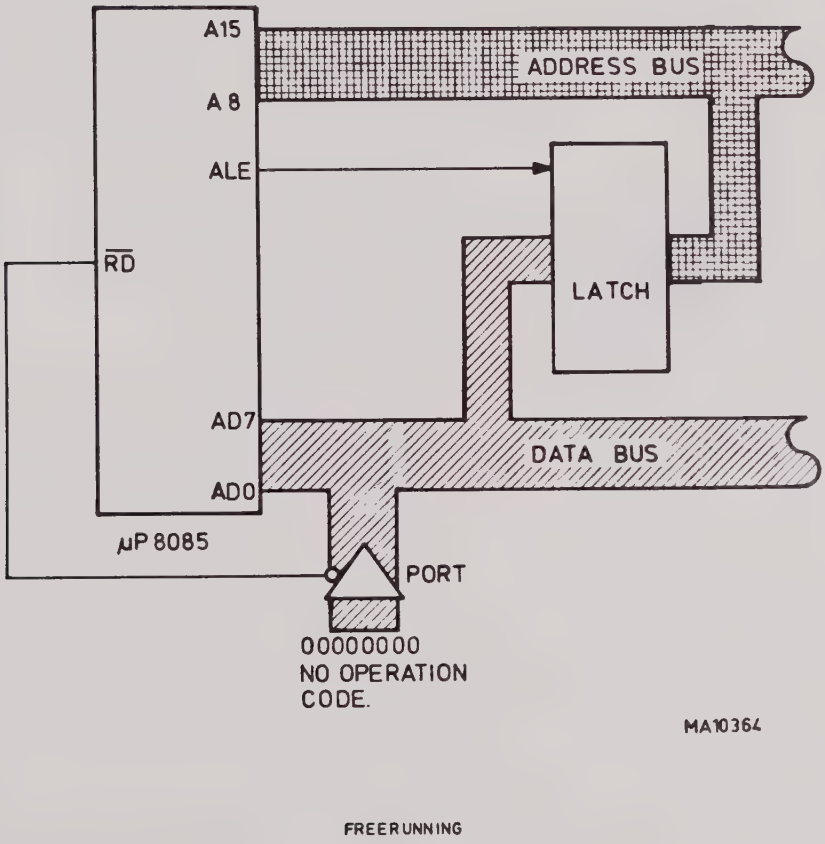


Fig. 7. Free-running

4.1. FREE-RUNNING

The μP can be tested free-running by connecting the multiplexed address-data bus to ground during the read-cycle. That means that instruction NOP (No OPeration) is fed to the μP. After a reset the μP starts at address 0000 (Hex) NOP-instruction is read and fed to the μP. The μP increments the Program Counter and reads again the same NOP-instruction.
In this mode the Program Counter counts from 0000 to FFFF which can be checked on the address bus by means of a logic analyzer, an oscilloscope or a signature analyzer.

The Logic-Scope PM 3540 is not provided with the facility of disconnecting the address-data bus so that the μP can only be tested free-running by using an external device.
This facility can be created on an external board using the concept shown mechanically and electronically in figures 8 and 9.

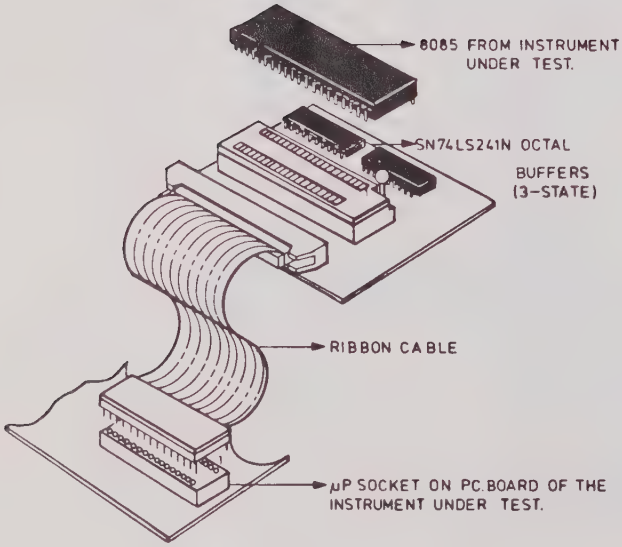

8085 FROM INSTRUMENT UNDER TEST.
SN74LS241N OCTAL BUFFERS (3-STATE)
RIBBON CABLE
μP SOCKET ON PC.BOARD OF THE INSTRUMENT UNDER TEST.

Fig. 8. Free-running test set-up (Mechanical)

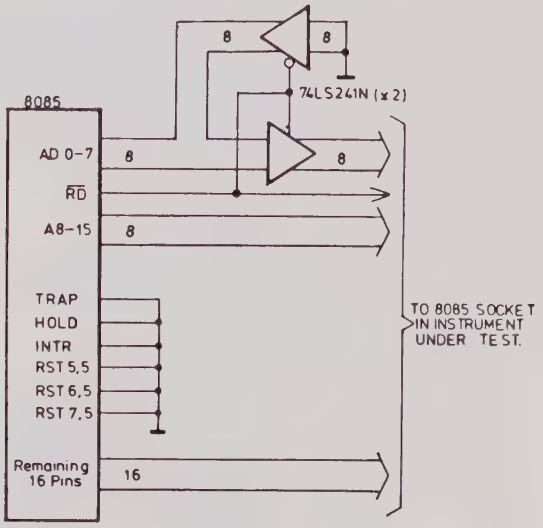


Fig. 9. Free-running test set-up (Electrical)

4.2. FREE-RUNNING TEST SET-UP

A plug-in device in accordance to above mentioned concept is currently being developed. For more information concerning this suitable device (which can be used for testing all 8085 μP-systems) contact N.V. Philips' Gloeilampenfabrieken, Eindhoven, S & I-Service - T & M the group Data Test Equipment.

5. MANUAL CONSEQUENCES DUE TO MODIFICATIONS

The following text refers directly to the appropriate sections in the manual. (no. 9499 503 00402).

1.2.2.2. Vertical amplifier

Frequency range	DC : 0 ... 35 MHz (–3 dB) AC : 2 Hz ... 35 MHz (–3 dB)	
Rise Time	⩽ 10 ns	
Pulse aberrations	⩽ ± 3 % (⩽ 4 % pp)	Measured at 6 div. amplitude and applied rise time of ⩾ 1 ns

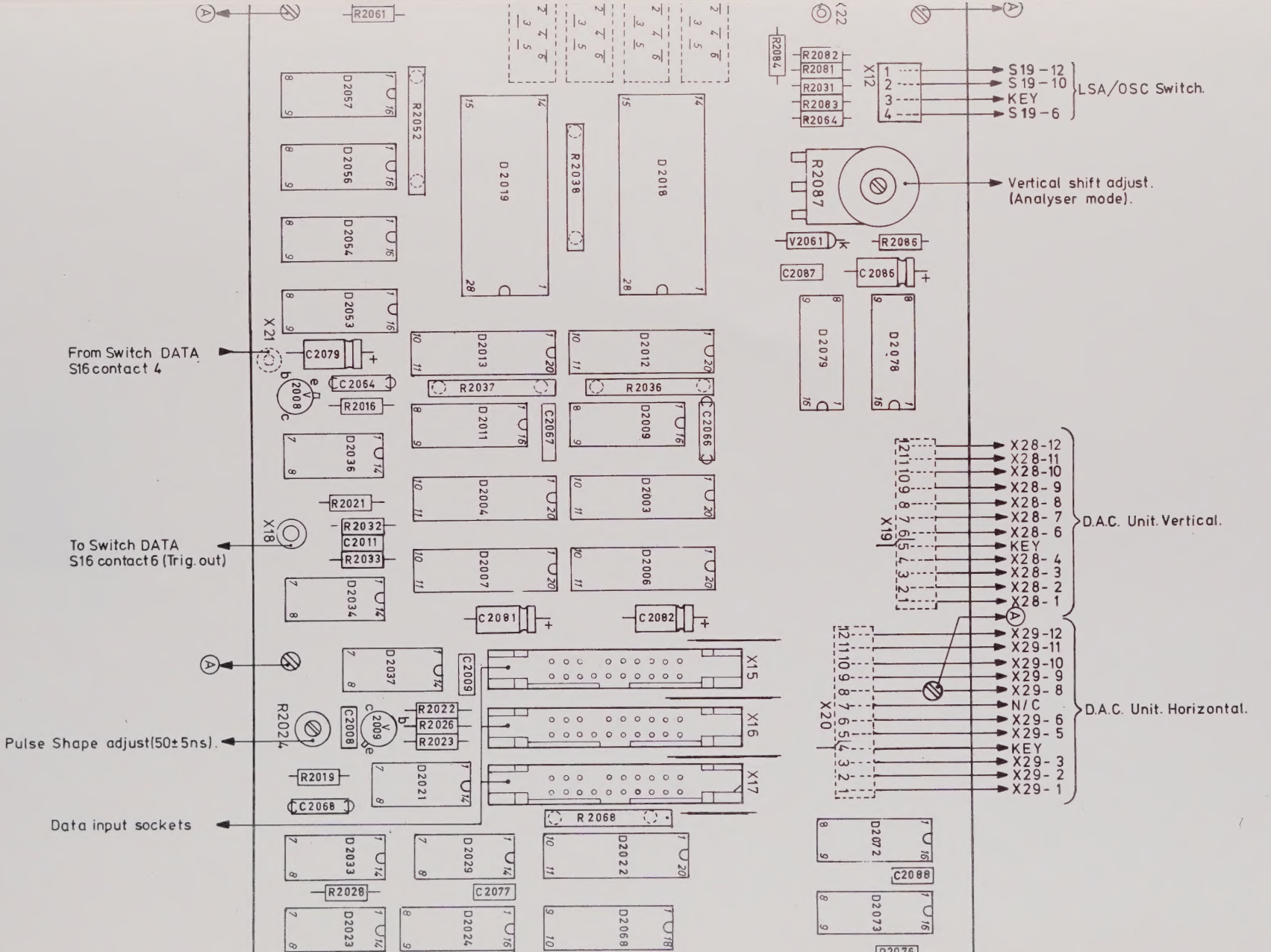
1.2.2.4. Triggering

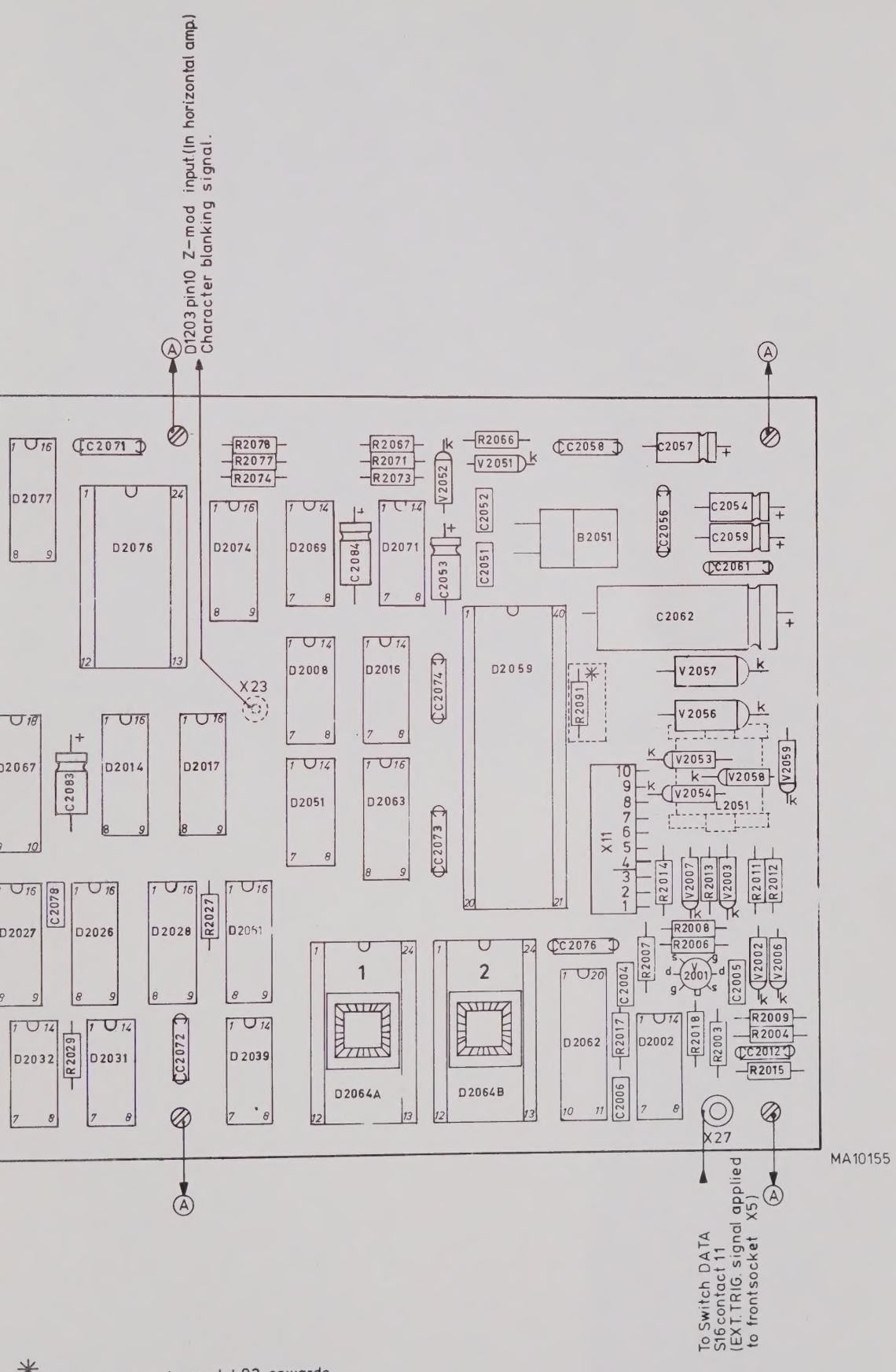
Trigger sensitivity	Internal : 1.0 DIV. at 35 MHz External: 0.2 Vpp at 35 MHz	
	TV int. : 0.7 DIV	Sync pulse amplitude
	TV ext.: 0.15 Vpp	Sync pulse amplitude
Triggering frequency range	AUTO : 20 Hz ... ⩾ 35 MHz AC : 5 Hz ... ⩾ 35 MHz DC : 0 Hz ... ⩾ 35 MHz	Typically, stable triggering can stil be obtained at 50 MHz and 2 div. or 1 Vpp amplitude.

3.8. INTEGRATED CIRCUITS

D2064 (A & B)	PROMset programmed	5322 209 14774	versions /01 and /02
D2064 (A & B)	PROMset programmed	5322 209 14782	versions /03 and onwards

Typical switch arrangement


S19-12
S19-10
KEY
S19-6
LSA/OSC Switch.
Vertical shift adjust.
(Analyser mode).
X28-12
X28-11
X28-10
X28-9
X28-8
X28-7
X28-6
KEY
X28-4
X28-3
X28-2
X28-1
D.A.C. Unit. Vertical.
X29-12
X29-11
X29-10
X29-9
X29-8
N/C
X29-6
X29-5
KEY
X29-3
X29-2
X29-1
D.A.C. Unit. Horizontal.
From Switch DATA
S16 contact 4
To Switch DATA
S16 contact 6 (Trig. out)
Pulse Shape adjust(50±5ns).
Data input sockets



✳These components model 03 onwards.

✳N/C = Not connected.

10. Micro-processor p.c. board

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